"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV, Nikolay Nikolayevich

[Lectures on quantum statistics; problems of statistical mechanics of quantum systems] Lektsii z kvantovoi statystyky; pytannia statystychnoi mekhaniky kvantovykh system. Kyiv, Radians'ka shkola, 1949. 227 p. (MIRA 12:7)
(Quantum statistics)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV, N.N.; TYABLIKOV, S.V.

Self-energy conservation in the nonrelativistic field theory.
Dop.AN URSR no.5:10-16 '49. (MIRA 9:9)

1.Diysniy chlen AN URSR (for Bogolyubov).2.Institut matematiki
AN URSR.
(Field theory) (Force and energy)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

BOGOLYUBOV, N. N.

PA32/49T90

USSR/Physics
Quantum Mechanics
Mathematics - Applied

Mar 49

"The Approximation Method of Finding the Lowest Energy Levels of Electrons in Metal," N. N. Bogolyubov, S. V. Tyablikov, Math Inst, Acad Sci USSR, $12\frac{1}{4}$ pp

"Zhur Eksper i Teoret Fiz" Vol XIX, No 3

Presents approximate method of secondary quanta for determining energy spectra of weekly excited states. Results are illustrated using theory of ferromagnetism as example. Establishes that definite electric

32/49T90

USSR/Physics (Contd)

Mar 49

current is connected with spin waves. Submitted 7 Oct 48.

32/49T90

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV, N. N.

PA 32/49T54

USSR/Mathematics -- Perturbation Method Mar 49
Physics -- Atomic Structure

"One Application of the Theory of Perturbation to the Polar Model of a Metal," N. N. Bogolyubov, S. V. Tyablikov, Math Inst, Acad Sci USSR, 5 pp

"Zhur Eksper i Teoret Fiz" Vol XIX, No 3

Presents results of one form of the theory of perturbation for a degenerate level applied to the polar model of a metal. Develops simple method enabling results of theory of perturbation to be used without recourse to method of secular equations. Submitted 7 Oct 48.

[redacted]

32/49T54

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

Source: Mathematical Reviews, Vol No.

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

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Ukra... Mat. 7... 3-24

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV, ~~M.M.~~ N.N.

[redacted]

Synchronization of relaxation oscillations. Nauk.zap.Kiev.un.9 no.9: 5-28 '50. (Oscillations) (MLRA 9:10)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

Bogolyubov, N. N., Bonč-Bruevič, V. L., and Medvedev, B. V. On the invariant construction of a quantum theory of fields. Doklady Akad Nauk SSSR (N.S.) 74, 681–684 (1950). (Russian)

Dirac [Rev Modern Physics 21, 392–399 (1949); Phys. Rev. 11, 409] has investigated the most [illegible] form of a classical relativistic [illegible] of localizable fields. In this paper the [illegible] determined for a theory [illegible] according to Bose statistics [illegible] of localizability. The formulae defining such [illegible] are complicated and involve many [illegible] was to be expected, since all fields [illegible] must be [illegible]

Mathematical Reviews, Vol. 12 [illegible]

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

Bogolyubov, N. N. On the fundamental equ[illegible]ons of the relativistic quantum theory of fields. [illegible] Akad. Nauk SSSR (N.S.) 31, 757-760 (1951). [illegible]

The most general relativistic quantum theory of interacting fields may be formulated by postulating [illegible] equations of motion.

$$(1)\qquad i\hbar(\partial\Psi/\partial\tau) = H(\tau,\xi)\Psi(\tau,\xi)$$
$$i\hbar(\partial\Psi/\partial\xi_\alpha) = H_\alpha(\tau,\xi)\Psi(\tau,\xi), \quad \alpha = 1, 2, [illegible]$$

to hold in the interaction representation. Here Ψ [illegible] is the state function defined on the space-like hyperpl[illegible]

$$(2)\qquad x_0\xi_0 - \sum x_\alpha\xi_\alpha = \tau,$$

where (ξ) is a time-like vector of length unity. The problem of constructing relativistic quantum theories is [illegible]valent to the problem of finding Hermitian operators H, H_α such that the equations (1) are simultaneously integrable.

The author remarks that suitable operators H, H_α may be found by writing

$$(3)\qquad H = i\hbar(\partial S/\partial\tau)S^\dagger, \quad H_\alpha = i\hbar(\partial S/\partial\xi_\alpha)S^\dagger,$$

where $S(\tau,\xi)$ is a formal power-series expansion

$$(4)\qquad S = \sum_0^\infty(-i/\hbar)^n S_n$$

satisfying formally the unitarity conditions

$$(5)\qquad \sum_{k=0}^n(-1)^{n-k}S_kS^\dagger_{n-k} = 0, \quad n = 1, 2, [illegible]$$

The point is that even when the expansion (4) is [illegible] and a [illegible] operator S satisfying (3) does [illegible] the [illegible] obtained by substituting [illegible] not [illegible] and the operators H, [illegible]

F. J. Dyson [illegible]

Source: Mathematical Reviews, Vol 13 No. 7

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

Bogoljubow, N. N. Zum Problem der Grund[illegible] der relativistischen Quantentheorie [illegible]

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV, N. N.

Source: Mathematical Reviews, Vol 13 No.7

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The problem of constructing such a theory is to find a Hermitian operator Q satisfying (3) and also the condition

$[H(x_1), H(x_2), \ldots, H(x_n)]$

(8) $Q = \sum \ldots \int Q \ldots dx_n$

This paper ... [Physical Rev. 81 ...]

in a main ...

... regularization.

Source: Mathematical Reviews, Vol 13 No. 7

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

USSR/Mathematics - Physics

Card 1/1 Pub. 22 - 10/40

Authors : Bogolyubov, N. N., Academician

Title : On the presentation of Green-Shvinger's functions by functional integrals

Periodical : Dok. AN SSSR 99/2, 225-226, Nov 11, 1954

Abstract : A method is presented for an interpretation of Green-Shvinger's functions by the so-called "functional quadratures" through averaging ordinary Green's functions along quantum functions of the field φ. One reference (1954).

Institution: Mathematical Institute im. V. A. Steklov of the Acad. of Scs. of the USSR

Submitted : ...

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Bogolyubov, N. N.

1 - F/W

★Bogolyubov, N. N., i Mitropol'skii, Yu. A. Asimptoticeskie metody v teorii nelineinyh kolebanii. [Asymptotic methods in the theory of nonlinear oscillations.] Gosudarstv. Izdat. Tehn.-Teor. Lit., Moscow, 1955. 449 pp. 13.40 rubles.

1/4

The present book is the fourth or fifth major treatise published in recent years by Soviet scientists on the general topic of non-linear oscillations, which serves to indicate the great value which is attached in the USSR to this general topic. The general program of the book is not too far from the program of the 1937 Krylov-Bogolyubov monograph [Introduction to non-linear mechanics, Izdat. Akad. Nauk SSSR, Kiev, 1937; see MR 4, 142]. However, although the book is addressed primarily to physicists and engineers, its mathematical treatment is most careful, which was by no means the case with the 1937 monograph. The book is also much more orderly and most readable: an excellent contribution in every respect.

(1)

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Let us pass now to a more detailed description. The book consists of a lengthy introduction and five chapters.

Introduction. One finds here a large number of examples: physical, mechanical, electrical, illustrating the appearance of non-linear oscillations in various domains. The description is always careful and clear.

Chapter I: Self-oscillations in nearly linear systems. The prototype is

(1) $\ddot{x}+\omega^2 x=\varepsilon f(x, \dot{x}), \varepsilon \geqq 0$ and small.

The basic solution

(2) $x=a \cos \psi=a \cos (\omega t+\varphi)$

is used as a starter and one tries to find a solution for (1), with a, ψ variable, of the form

(3) $x=a \cos \psi+\varepsilon u_1(a, \psi)+\varepsilon^2 u_2(a, \psi)+\cdots,$

where the u_n are periodic with period 2π in ψ and

(4) $\dot{a}=\varepsilon A_1(a)+\varepsilon^2 A_2(a)+\cdots,$

(5) $\dot{\psi}=\omega+\varepsilon B_1(a)+\varepsilon^2 B_2(a)+\cdots$

(slowly varying amplitude and phase). Upon dropping

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everywhere the terms of degree $> m$, one obtains the mth approximation. The solutions are found by substituting in (1) and identifying like powers of ε yielding an infinite system of differential equations. The arbitrariness involved is settled by imposing

$$(6)\qquad \int_0^{2\pi} \begin{Bmatrix} u_1 \\ u_2 \end{Bmatrix} \cos\psi\, d\psi = \int_0^{2\pi} \begin{Bmatrix} u_1 \\ u_2 \end{Bmatrix} \sin\psi\, d\psi = 0.$$

A number of special cases are treated at length.

Chapter II: Method of the phase plane. This is familiar ground. Of particular interest is the treatment of relaxation oscillations, including the Dorodnytsin treatment of the approximation for the period and amplitude for large values of the parameter (like the one in van der Pol's equation).

Chapter III: Influence of forced oscillations. Here the f of (1) is of the form $f(\nu, t, x, \dot{x})$, with ν as the imposed frequency, and f with period $2\pi i n \nu t$. More precisely,

$$f = \sum_{n=-N}^{+N} e^{in\nu t} f_n(x, \dot{x}).$$

Careful distinction is made between resonance and nonresonance. The attempted solution is again (3), under conditions (4), (5), and with u_n now of the form $u_n(a, \psi, \nu t)$.

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Chapter IV: Averaging method. The system studied is

(7) $$\dot{x}=\varepsilon X(t, x)$$

where x, X are n-vectors and the treatment is by vector-matrix throughout. Let

$$X_0(\zeta)=\lim_{T\to+\infty}\frac{1}{T}\int_0^T X(t, \zeta)dt,$$

and let ζ be a solution of $\dot{x}=\varepsilon X_0(\zeta)$. Then ζ is considered as the first approximation and from it one passes to higher approximations by using suitable Fourier series expansions.

Chapter V: Foundation of the asymptotic methods. In substance it is shown rigorously that under certain very general assumptions, the approximation methods of the previous chapters are justified.

The volume terminates with an all too short bibliography and there is no index. *S. Lefschetz.*

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV, N.N.

Bogolyubov, N. N., and Zubarev, D. N. The method of asymptotic approximation for systems with revolving phase and its application to the motion of charged particles in a magnetic field. Ukrain. Mat. Z. 7 (1955), 5–17. (Russian)

1-F/W

MS

The physical problem attacked by the authors is that of describing the non-relativistic motion of a charged particle in a non-homogeneous magnetic and electric field under the assumption that the Larmor frequency $\omega_H = eH/mc$ is large and that the magnetic field does not change greatly over the Larmor circle, or, as expressed by the authors $R_L H^{-1} dH/dx \ll 1$, R_L being the radius of the Larmor circle, $R_L = w/\omega_H$, where w is the component of velocity of the particle in a plane perpendicular to the magnetic field. [This particular physical problem was previously considered by H. Alfvén, Ark. Mat. Astr. Fys. 27A (1941), no. 22; MR 6, 168.] By means of an asymptotic expansion valid for large values of the frequency, the motion of the particle can be described as the superposition of the rotation of the particle on the Larmor circle and the motion of the center of gravity of the circle. The result of the authors can be described in these terms: Let ϵ_0, ϵ_1, ϵ_2 be a moving orthonormal frame, where ϵ_0 is parallel to the magnetic field, H, and ϵ_1, ϵ_2 lie in a plane

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6

Bogolyubov, N.N., and Zubarev, D.N.

perpendicular to **H**. Let **v** be the velocity of the particle and let u be the component of the velocity parallel to **H**, let w be the magnitude of $\mathbf{v}-u\boldsymbol{\epsilon}_0$, and let $\mathbf{r}=\int \mathbf{v}\,dt$. Then

$$\mathbf{r}=\bar{\mathbf{r}}+\left(\frac{w}{\omega_H}\right)(\boldsymbol{\epsilon}_2\cos\bar{\alpha}-\boldsymbol{\epsilon}_1\sin\bar{\alpha}),\quad \alpha=\bar{\alpha}+O\left(\frac{1}{\omega_H}\right),$$

α being the angular coordinate, where furthermore

$$\frac{d\bar{\mathbf{r}}}{dt}\approx u\boldsymbol{\epsilon}_0-\left\{\left(-\frac{1}{\omega_H}\right)\mathbf{F}+\left(\frac{w^2}{2\omega_H{}^2}\right)\nabla\omega_H+\left(\frac{u^2}{\omega_H}\right)(\boldsymbol{\epsilon}_0\nabla)\boldsymbol{\epsilon}_0\right\}\times\boldsymbol{\epsilon}_0,$$

$$\frac{dw}{dt}\approx-\left(\frac{uw}{2}\right)\operatorname{div}\boldsymbol{\epsilon}_0,\quad \frac{du}{dt}\approx\mathbf{F}\cdot\boldsymbol{\epsilon}_0+\left(\frac{w^2}{2}\right)\operatorname{div}\boldsymbol{\epsilon}_0,$$

F being the force of the electric field. The authors further obtain the fact that $w^2/H=\text{const.}+O(1/\omega_H)$, expressing the fact that the magnetic flux through the Larmor circle is nearly constant. They point out in conclusion that the same methods may be used in studying gyroscopic motion. *W. L. Baily* (Princeton, N.J.).

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV, N.N.

3
1-484c

3597. EQUATIONS WITH VARIATIONAL DERIVATIVES IN PROBLEMS OF STATISTICAL PHYSICS AND QUANTUM FIELD THEORY. N.N. Bogolyubov.

Vestnik Moskov. Univ., Vol 10 No 4-5, 115-24 (1955) In Russian.

A lecture surveying the field of variational equations [illegible]

The main thesis is that the method [illegible] introduced into quantum field theory by Schwinger [illegible] can be used [illegible]

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Bogolyubov, N.N.

2

7595
CONDITION OF CAUSALITY IN THE QUANTUM THEORY OF FIELDS. N. N. Bogolyubov. Izvest. Akad. Nauk S.S.S.R., Ser. Fiz. 19, 237-48(1955) Mar.-Apr. (In Russian)

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV, N. N.

USSR.

530.162

5898. Wave-function for the ground state of an assembly of bosons with mutual interaction. N. N. BOGOLYUBOV AND D. N. ZUBAREV. *Zh. éksper. teor. Fiz.* 28, No. 2, 129–39 (1955) In Russian.

Hamilton operator, wave-function and energy are expanded in powers of a small parameter which vanishes in the limit of vanishing interaction. The wave equation is transformed by substituting new independent variables as previously defined [Abstr. 754 (1955)]. These variables (Fourier coefficients of density) are used for expressing the unperturbed wave-function of the ground state in a relatively simple form. The unperturbed Hamilton operator is obtained in a form that is similar to the expression found by second quantization; it is, however, interpreted by the authors in terms of the energy of photons. Corrections of the energy and wave-functions are proportional to the square of the small parameter and are obtained in a relatively simple form. Discussing results obtained by other authors, superiority is claimed for the method employed in the present paper.

R. EISENSCHITZ

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BOGOLYUBOV, N. N.

USSR/Physics - Field theory

Card 1/2 Pub. 118 - 1/3

Authors : Bogolyubov, N. N. and Shirokov, D. V.

Title : Problems of the quantum theory of a field

Periodical : Usp. Fiz. nauk 55/2, 149-214, Feb 1955

Abstract : The quantum theory of a field is considered. Due to a localizing character of the present day quantum theory, the complete description of a field by this theory meets with considerable difficulties. In order to overcome these difficulties, a study of their nature is suggested. For this purpose, a method of transformation of the so-called "field function" (used in the ordinary quantum theory) into the so-called "operators" (used in an advance quantum theory) is presented. Then, problems are considered which involve the determination of singular integrable operators playing a very important role in the analysis of the

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

Card 2/2 Pub. 118 - 1/3

Periodical : Usp. Fiz. nauk 55/2, 149-214, Feb 1955

Abstract : matrixes of dispersion of the theory of interacting fields. Then a method is introduced for the construction of a matrix of dispersion that would be based, not on the Hammiltonian formation, as was done in the ordinary quantum theory, but on the Lagrangenian of an interaction ($\mathcal{L}(x)$) in which physical conditions, relativistic covariation, unitorsion and causality of the matrix elements play the role of a Hammiltonian. Then, a method is presented for determining the so-called "chronological products", i.e., T-products of ordered elements of the matrix of dispersion. This is done with the help of Wick's theorem on the evaluation of the chronological products. In conclusion an application of the Wick theorem to the Feynman rules of evaluation of matrix elements is presented. Twenty-one references: 4 USSR, 10 USA, 3 Brit. and 4 Swiss (1939-1953). Table.

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BOGOLYUBOV, N N.

SUBJECT USSR/MATHEMATICS/Applied mathematics CARD 1/2 PG - 19
AUTHOR BOGOLJUBOV N.N., ŠIRKOV D.V.
TITLE Problems of the quantum field theory.II. The removal of divergences from the dispersion matrix.
PERIODICAL Uspechi fiz. Nauk. 57, 3-92 (1955) reviewed 5/1956

At first the terms of second and third order in the S-matrix of the quantum electrodynamics are discussed in detail by use of the Feynman diagrams. The convergence of a matrix element depends entirely on the convergence of the expression $\Sigma(p)$. For its regularization a single auxiliary mass M is sufficient. The author investigates the behavior of the regularizated expression for $M \longrightarrow \infty$. The general rule for the removal of the divergences consists in the fact that the true causal functions $\Delta^c(x)$ are replaced by regularizated expressions $[\Delta^c(x)]$ which are obtained by a suitable number of auxiliary masses M. However, in general the limiting process $M \longrightarrow \infty$ is not even possible in the improper sense. The author introduces a classification of renormability. Then as an example the well-known quantum electrodynamics is treated. The number of different types of diagrams is restricted essentially by several conditions (e.g. loading invariance). With regard to the theorem of Furry finally there exist only four divergent diagrams in the quantum electrodynamics. The S-matrix is discussed in detail and it is shown

Translation D419421 - p.49

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Uspechi fiz. Nauk. 57, 3-92 (1955) CARD 2/2 PG - 19

that the introduction of five terms of compensation in the Lagrange function of the interaction leads to the renormalization of mass and loading of the free fermion.

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BOGOLYUBOV, N.N.

SUBJECT USSR/MATHEMATICS/Applied mathematics CARD 1/2 PG-546/547
AUTHOR BOGOLJUBOV N.N., PARASJUK O.S.
TITLE On the theory of multiplications of singular causal functions. On a formalism of subtraction for the multiplication of singular causal functions.
PERIODICAL Doklady Akad.Nauk 100, 25-28 (1955)
Doklady Akad.Nauk 100, 429-432 (1955)
reviewed 1/1957

As a continuation of earlier papers of the authors (Doklady Akad.Nauk 81, nos. 5 and 6 (1951), ibid. 82, no. 2 (1952)), in the first paper a detailed treatment of the singular expressions appearing in the theory of perturbation is given. In order to give a mathematically exact treatment, the authors "regularize" the used "functions of propagation" and write e.g.

$$\operatorname{reg} \Delta^c(x) = \frac{i}{(2\pi)^4} \int e^{ikx} \int_0^\infty \left[1+\sum c_j e^{-i\alpha(M_j^2-m^2)}\right] e^{i\alpha(k^2-m^2+i\varepsilon)} dk\,d\alpha,$$

where the auxiliary masses M_j and the constants c_j satisfy (h+1) conditions of the kind $\sum M_j^{2l} c_j = 0$; $l = 0,1,\ldots h$, (In the usual applications we have h=1).

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Doklady-Akad.Nauk 100, 25-28 (1955)
Doklady Akad.Nauk 100, 429-432 (1955) CARD 2/2 PG - 546/547

On this basis then a strong formulation of the treatment of divergent integrals in the theory of perturbation is given. Renormalizations are considered too.- In the second paper a general form for the result of the first paper is given. The established equations are proved by induction from n to n+1.

INSTITUTION: Acad. of Scs. of the USSR, and The V. A. Sfeklov Mathematical Institute, Acad. of Scs. of the UkrSSR, Institute of Mathematics.

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

Bogolyubov, N. N., [illegible] D. V. On the renormali- [illegible]
zation group in [illegible] electrodynamics [illegible]

[illegible]
26 [illegible] in its simple [illegible]
scale transformations

(1) $$D \to \tau D, \quad e \to \tau^{-1} e,$$

where D is the Maxwell field [illegible]
[illegible]

use this fact to establish a [illegible]
[illegible] function [illegible]

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The transformation [illegible]
[illegible]

propagator

[illegible] is similar [illegible]

Bogolyubov, N. N. and Shirkov, D. V. [illegible]
renormalization group to improvement of formulas of
perturbation theory [illegible]

From the [illegible]
the authors derive asymptotic relations for the [illegible]

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large and small values of the momenta. These relations are by [illegible] means sufficient to fix uniquely the forms of the functions. [illegible] propagat[illegible] assumpt[illegible] alone, then the form of this function is uniquely determined, in agreement with the result of L. D. Landau, A. A. Abrikosov and I. M. Halatnikov [same Dokl. 96 (1954), 261–264; MR 16, 316]. The authors do not consider the latter assumption to be mathematically justified, since it rests strongly on perturbation-theory approximations.

There is a misprint in Eq. (13), where the first denominator 4π should be replaced by π. *F. J. Dyson*

3

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV,N.N., akademik; SHIRKOV,D.V.

Application of renormalized groups to the improvement of the perturbation theory. Dokl. AN SSSR 103 no.3:391-394 Jl'55.
(MLRA 8:11)

1. Matematicheskiy institut imeni V.A.Steklova Akademii nauk SSSR
(Perturbation) (Quantum theory)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV, N.N., akademik; SHIRKOV, D.V.

A Lee-type model in quantum electrodynamics. Dokl. AN SSSR 105 no.4:685-688 D '55. (MLRA 9:3)

1. Matematicheskiy institut imeni V.A. Steklova Akademii nauk SSSR.

(Quantum theory)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV, N. N., and TYABLIKOV, S. V. (Moscow)

"Approximative secondary quantization methods in the quantum theory of magnetizm," a paper submitted at the International Conference on Physics of Magnetic Phenomena, Sverdlovsk, 23-31 May 56.

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV, N.N.

TAVKHELIDZE, A.N.; BOGOLYUBOV, N.N., akademik, nauchnyy rukovoditel'.

[Field theory methods in problems with a fixed nucleon source; abstract of a dissertation offered for the degree of candidate of physical and mathematical sciences] Metody teorii polia v zadachakh s fiksirovannym nuklonnym istochnikom; avtoreferat dissertatsii, predstavlennoi na soiskanie uchenoi stepeni kandidata fiziko-matematicheskikh nauk. Moskva, Akad.nauk SSSR, 1956. 5 p. (MIRA 10:11)

(Nucleons)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

FRENKEL', Ya.I.; SEMENOV, N.N., akademik, redaktor; SOKOVOV, A.A., doktor fiziko-matematicheskikh nauk, redaktor; BOGOLYUBOV, N.N., akademik, redaktor; TAMM, I.Ye., akademik, otvetstvennyy redaktor; ANSEL'M, A.I., doktor fiziko-matematicheskikh nauk, redaktor; BLOKHINTSEV, D.I., doktor fiziko-matematicheskikh nauk, redaktor; KONTOROVA, T.A., kandidat fiziko-matematicheskikh nauk, redaktor; GOLANT, V.Ye., redaktor izdatel'stva; SMIRNOVA, A.V., tekhnicheskiy redaktor

[Selected works] Sobranie izbrannykh trudov. Moskva, Izd-vo Akademii nauk SSSR. Vol.1. [Electrodynamics; general theory of electricity] Electrodinamika; obshchaia teoriia elektrichestva. 1956. 370 p. (MLRA 9:11)

1. Chlen korrespondent AN SSSR (for Frenkel')
(Electrodynamics)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

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does not require summation

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV, N.N.; PARASYUK, O.S.

Subtraction formalism associated with the multiplication of causality functions. Izv. AN SSSR, Ser. mat. 20 no.5:585-610 S-O '56. (MIRA 11:6)

(Quantum theory) (Functions)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

Bogolyubov, N.N.

6000

530.145

2

4806. MULTIPLICATIVE RENORMALIZATION GROUP IN QUANTUM FIELD THEORY. N.N.Bogolyubov and D.V.Shirkov. Zh. eksper. teor. Fiz., Vol. 30, No. 1, 77-88 (1956). In Russian.

Lie differential equations for the multiplicative renormalization group of quantum field theory are presented. As an illustration of application of the equations spinor electrodynamics Green's functions have been determined in the ultraviolet and infrared catastrophe regions.

A.

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

~~BOGOLYUBOV, N.N.~~ BOGOLYUBOV, N.N.

SUBJECT USSR/MATHEMATICS/Theory of functions CARD 1/2 PG - 678
AUTHOR BOGOLJUBOV N.N., PARASJUK O.S.
TITLE On the analytic continuation of generalized functions.
PERIODICAL Doklady Akad.Nauk 109, 717-719 (1956)
reviewed 4/1957

For complex-valued functions $\Phi(E)$ of a real argument E, $-\infty < E < \infty$ of $\mathcal{L}^2(-\infty, +\infty)$ there holds the theorem that these functions are continuable into the upper halfplane if and only if their Fourier transform $\phi(t)$ vanishes for $t<0$. The development of the modern quantum theory, its spacius connection with the analytic continuation induce the authors to transfer the above mentioned theorem to generalized functions. Generalized functions f(E) are linear functionals on the spaces C(q,r,1) of the function $\varphi(E)$ which have q-derivatives, where all products $E^s \frac{d^p \varphi(E)}{dE^p}$ $(s=0,1,\ldots r;\ p=0,1,\ldots q)$ are bounded (compare Bogoljubov and Širokov, Uspechi fiz. Nauk 5, No.2, 141 (1955); and Parasjuk, Doklady Akad.Nauk 100, No.4, (1955)). If f(E) is a functional on C(q,r,1), then f(E) is called integrable on C(q,r,1). In R the generalized function f(t) equals zero if the functional determined by it equals zero on those functions which annihilate themselves outside of $\bar{R}$.
Definition: a generalized complex-valued function $\tilde{f}(E)$ is called analytically

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Doklady Akad.Nauk 109, 717-719 (1956) CARD 2/2 PG - 678

continuable into the above halfplane of the plane $z = E+i\Gamma$ if there exists an analytic function $\tilde{f}(E+i\Gamma)$ such that 1) $\tilde{f}(E+i\Gamma)$ for $\Gamma \to 0$ tends to $\tilde{f}(E)$ in the sense of the weak convergence and 2) there holds the estimation

$$|\tilde{f}(E+i\Gamma)| \leq A_0(\delta)|E|^m + A_1(\delta)|E|^{m-1} + \dots + A_n(\delta),$$

where m is a positive integer and the A_i are real constants depending on δ only.

Theorem: In order that the generalized complex-valued function $\tilde{f}(E)$ is analytically continuable into the upper halfplane it is necessary and sufficient that the Fourier transform $f(t)$ of $\tilde{f}(E)$ vanishes for $t<0$.

INSTITUTION: Math.Inst.Acad.Sci. USSR.

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

PROBLEMS OF THE THEORY OF DISPERSION IN-
TERRELATIONSHIPS. N. N. [illegible]
[illegible] M. K. [illegible]

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

Call Nr: QC 174.5.B6

Introduction to the Theory of Quantum Fields (Cont.)

COVERAGE: The authors have attempted to give a systematic presentation of the development of the theory of quantum fields, from its basic principles to its latest achievements, with emphasis on mathematical accuracy and on reporting the latest, most promising trends. The authors express their appreciation to the staffs of the Department of Theoretical Physics, Institute of Mathematics im. V. A. Steklov, USSR Academy of Sciences, and of the Department of Statistical Physics and Mechanics, Moscow State University im. M. V. Lomonosov, in particular to B. V. Medvedev, for help in writing the book. There are 107 references, 37 of which are Russian, 1 Polish, 3 French, 1 German, 48 American, 17 Italian, Swiss, Dutch.

Card 2/2

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV, N.N.

48-6-13/23

SUBJECT: USSR/Physics of Magnetic Phenomena

AUTHORS: Bogolyubov, N.N. and Tyablikov, S.V.

TITLE: Approximate Methods of Secondary Quantization in the Quantum Theory of Magnetism (Priblizhennyye metody vtorichnogo kvantovaniya v kvantovoy teorii magnetizma)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, 1957, Vol 21, #6, pp 849-853 (USSR)

ABSTRACT: The problem of a rigorous calculation of the energetic spectrum for ferromagnetic materials is extremely difficult, and therefore, approximate methods were devised for its treatment.

These methods enter into two stages of calculations:

1. The constructing of a simplified "model" Hamiltonian which conveys characteristic peculiarities of a studied dynamic system;
2. The formulation of an approximate method for such a simplified Hamiltonian.

The starting point in constructing the simplified Hamiltonian is a rigorous Hamiltonian of the system in secondary quantization presentation. However, only a part of the atomic wave functions is accounted in actual calculations, following the ideas

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

48-6-13/23

TITLE: Approximate Methods of Secondary Quantization in the Quantum Theory of Magnetism (Priblizhennyye metody vtorichnogo kvantovaniya v kvantovoy teorii magnetizma)

of Ritz.

Then an approximate method is applied to this simplified Hamiltonian. The resulting form coincides with the form of the second variation in the quasi-classical treatment.

Since in this approximation the Hamiltonian is a quadratic form of Bose-operators, its diagonalization does not present any difficulties.

This method of calculating the energetic spectrum of weakly-excited states was applied by the authors to the theory of ferromagnetic materials and led to the known results in the Bloch theory of spin waves. When spin-spin and spin-orbital interaction terms are included into the Hamiltonian, it is possible to calculate the temperature- and field intensity-dependence of the magnetic anisotropy (4, 5) and the magnetostriction (6). The methods developed were also applied to the theory of antiferromagnetism (2).

Card 2/3 There are 11 references, 10 of which are Russian.

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

48-6-13/23

TITLE: Approximate Methods of Secondary Quantization in the Quantum Theory of Magnetism (Priblizhennyye metody vtorichnogo kvantovaniya v kvantovoy teorii magnetizma)

ASSOCIATION: Physical Department of the Moskva State University imeni Lomonosov.

PRESENTED BY:

SUBMITTED: No date indicated.

AVAILABLE: At the Library of Congress.

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APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV, N.N.; SANOCHKIN, Yu.B.

[redacted]

Ludwig Boltzmann. Usp.fiz.nauk 61 no.1:7-15 Ja '57. (MLRA 10:2)
(Boltzmann, Ludwig, 1844-1906)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

PA - 3134

AUTHOR BOGOLYUBOV N.N., Member of the Academy, SHIRKOV D.V.

TITLE Dispersion Relations For the COMPTON Scattering On Nucleons (Dispersionnyye sootnosheniya dlya komptonovskogo rasseyaniya na nukleonakh -Russian)

PERIODICAL Doklady Akademii Nauk SSSR, 1957, Vol 113, Nr 3, pp 529-532 (U.S.S.R.)
Received 6/1957 Reviewed 7/1957

ABSTRACT For the analysis of the amplitude f of COMPTON scattering the authors confine themselves to the examination of the main term proportional t e^2. They therefore put e = 0 in the expressions for the corresponding variation derivations, on which occasion only strong interactions are taken into account. The dispersion relations for the scattering of photons by nucleons can be determined by the same method by which N.N.BOGOLYUBOV determined the dispersion relations for the scattering of pions by nucleons. At first an ansatz for the amplitude of COMPTON scattering is written down. A function occurring in this ansatz is the impulse image of the "causal" matrix element. Besides, "retarded" and "advanced" matrix elements are introduced. For the imaginary case $\lambda^2 = E^2 - \vec{p}^2 - \tau, \tau < -\vec{p}^2$, functions $S \pm \tilde{f}$ can be defined which are analytical (with the exception of intersection lines and poles on the real axis) within the entire plane of the complex variables E. The intersection lines and poles are determined according to a complete function system by development of the HAMILTONIAN of the meson- and the nucleon field. The amplitude of COMPTON scattering in infinity is assumed to have a pole of, at the most, first order.

Card 1/2

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Dispersion Relations For the COMPTON Scattering On Nucleons. PA - 3134

Also the exclusion of the unobservable domain of the negative energies is discussed in short. The dispersion relations obtained herehave the following important properties: Not only on the occasion of scattering in a forward direction, but also for a finite interval of recoil impulse these dispersion relations contain no unobservable domain of energy. (1 illustration)

ASSOCIATION United Institute for Nuclear Research
PRESENTED BY
SUBMITTED 29.3.1956
AVAILABLE Library of Congress
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APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

Bogolyubov, N.N.

20-5-11/54

AUTHORS: Bogolyubov, N. N., Academician
Bilen'kiy, S. M., Logunov, A. A.

TITLE: Dispersion Relations in Cases of Weak Interaction (Dispersionnyye sootnosheniya v sluchayakh slabogo vzaimodeystviya).

PERIODICAL: Doklady Akademii Nauk SSSR, 1957, Vol. 115, Nr 5, pp. 891-893 (USSR)

ABSTRACT: At present dispersion relations meet with considerable interest because in this way the fact of the existence of an elementary length can be determined experimentally. It is of interest to analyze what these relations tell us in the case of a weak interaction. As an example the authors investigate the reaction

$$\mu + p \rightarrow n + \nu$$

in which, besides a weak interaction, there exists a strong interaction between nucleon and the meson field. In the theory of the dispersion relations the amplitude of the process is split up into a hermitean and an antihermitean part. In those systems of coordination in which the sum

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Dispersion Relations in Cases of Weak Interaction 20-5-11/54

of the momenta of the nucleon before and after the reaction is equal to zero, the hermitean part D is equal to a certain integral of the antihermitean part A plus any polynomial $P_n(E)$ above the energy E of the impinging particle. The antihermitean part of the amplitude is expressed by the product of the meson current and the neutrino current. Because of the smallness of the constant of the weak interaction only those terms must be taken into account which contain the coupling constant in first approximation. This product is here at least small of second order and therefore the antihermitic part in the approximation investigated here is equal to zero. Accordingly, the dispersion relation takes on an especially simple form: $D(E) = P_n(E)$. Next, the matrix element of the process $\mu + p \rightarrow n + \nu$ is written down and transformed. The unknown functions of the amplitude of the process determined by strong interaction depend only upon the transmission of the momentum to the nucleons. By

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Dispersion Relations in Cases of Weak Interaction 20-5-11/54

studying the dependence of these functions of the transmission of the momentum to the nucleon, the "meson-neutrino structure" of the nucleon can be determined. The effective measurements of the "meson-neutrino structure" are apparently the same as the "meson structure". The results obtained here are well suited for the β-decay and for those processes of decay of hyperons and K-mesons, in which, together with particles which are in strong interaction, also μ, e- and ν - particles participate. From the point of view of the verification of the causation principle the study of angular- and energy distribution of the electrons and myons in the processes of decay of the hyperons and K-mesons is of special interest. There are 1 figure, and 2 Slavic references.

ASSOCIATION: United Institute for Nuclear Research (Ob"yedinennyy institut yadernykh issledovaniy).

SUBMITTED: May 22, 1957

AVAILABLE: Library of Congress

CARD 3/3

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

AUTHORS: Bogolyubov, N.N., Academician, Zubarev, D.N., Tserkovnikov, Yu. A. 20-117-5-16/54

TITLE: On the Theory of Phase Transition (K teorii fazovogo perekhoda).

PERIODICAL: Doklady AN USSR, 1957, Vol. 117, Nr 5, pp. 788-791 (USSR)

ABSTRACT: The theory of supraconductivity may be conveniently developed by starting from a model -Hamiltonian function (gamil'tonian) of the form $H = H_o + H_{int}$, $H_o = \sum_{k,s} (E(k)-\lambda) a^+_{k,s} a_{k,s}$,

$$H_{int} = -(J/V) \sum_{(k \neq k')} a^+_{-k,-1/2} a^+_{k,1/2} a_{k',1/2} a_{-k,-1/2}.$$

The summing up process in H_{int} is extended only to the momenta, k,k', belonging to the energy level $E_F - \omega < E(k) < E_F + \omega$. The author show, that in the case of this Hamiltonian it is possible to construct the thermodynamic potential $\Psi = F - \lambda N = -\theta \ln Sp\, e^{-H/\theta}$ at $V \rightarrow$ in an asymptotically exact manner. Moreover, a computation of this kind is also possible for the more general expression $H = \sum_{k,s}$

$$(E(k)-\lambda) a^+_{k,s} - \frac{1}{V} \sum_{(k,k')} J(k,k') a^+_{-k,1/2} a_{k,1/2} a_{-k',-1/2}.$$

Because of the circumstance, that the theory of phase transition furnishes examples which can be solved only incorrectly, the authors considered it appropriate to develop a method for the computation of the ther-

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

On the Theory of Phase Transition. 20-117-5-16/54

modynamical functions of the Hamiltonian given just above, even the more, as applications to the theory of supraconductivity may emerge here. The authors here introduce the canonical transformation $\alpha_{k,1/2} = u_k \alpha_{k,0} + v_k \alpha^+_{k,1}$, $\alpha_{-k,-1/2} = u_k \alpha_{k,1} - v_k \alpha^+_{k,0}$, u_k, v_k denoting real functions, which are connected by the relation $u_k^2 + v_k^2 = 1$. The Hamiltonian thus transformed is given explicitly. Into the same shape is then transformed the statistical form of perturbation theory. The process of computation is followed step by step. The phase transition takes place at that temperature, at which one of the equation given here posesses a nontrivial solution. There are 3 references, 2 of which are Slavic.

SUBMITTED: November 13, 1957

Card 2/2

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

Name : BOGOLYUBOV, N. N.

Title : Academician

Remarks: In an article entitled "The Theory of Superconductivity", N. N. Bogolyubov gives a brief synopsis of his work in evolving this theory. For this work N. N. Bogolyubov was awarded the Lomonosov Prize, First Class, by the Moskva State University. N. N. Bogolyubov refers to the following people as colleagues: D. N. Zubarev, V. V. Tolmachev, S. V. Tyablikov, Yu. A. Tserkovnikov.

Source : N: Pravda, No. 365, 31 December 1957, p. 2, c. 1-3

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV, N. N.

"Many-Body Problem Studies and Their Application in the Theory of Nuclear Matter."

paper to be presented at 2nd UN Intl.' Conf. on the peaceful uses of Atomic Energy, Geneva, 1 - 13 Sept 58.

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV, N. N. and VLADIMIROV, V. S.

"On Analytic Continuation of Generalized Functions."

paper submitted at International Congress Mathematicians Edinburgh, 14 - 21 Aug 58.

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV, Nikolay Niolayevich; TOLLMACHEV, Vladimir Veniaminovich; SHIRKOV, Dmitriy Vasil'yevich; GUROV, K.P., red.izd-va; POLENOVA, T.P., tekhn.red.

[New method in the theory of superconductivity] Novyi metod v teorii sverkhprovodimosti. Moskva, Izd-vo Akad.nauk SSSR, 1958. 127 p.
(Superconductivity) (MIRA 11:6)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

16,24(5) PHASE I BOOK EXPLOITATION SOV/1217

Bogolyubov, Nikolay Nikolayevich; Medvedev, Boris Valentinovich; and Polivanov, Mikhail Konstantinovich

Voprosy teorii dispersionnykh sootnosheniy (Problems of the Theory of Dispersion Relations) Moscow, Fizmatgiz, 1958. 202 p. (Series: Sovremennyye problemy matematiki) 6,500 copies printed.

Ed.: Shirkov, D.V.; Tech. Ed.: Tumarkina, N.A.

PURPOSE: This book is intended for persons working in the quantum field theory who are interested in the method of dispersion relations and its mathematical structure.

COVERAGE: The book contains a detailed presentation of the mathematical structure of the method of dispersion relations. The main problems studied are the method of determining dispersion relations with the exactness needed in ordinary physics work, physical assumptions necessary for obtaining the dispersion relations, and to what degree dispersion relations are con-

Card 1/3

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

nected with recent quantum field theory. The book is dedicated to Vladimir Zalmanovich Blank (deceased). The authors thank the staff members of the Department of Theoretical Physics of the Matematicheskiy institut imeni V.A. Steklova (Mathematics Institute imeni V.A. Steklov) of the Academy of Sciences, USSR, and those of the Laboratory of Theoretical Physics of the Ob"yedinennyy institut yadernykh issledovaniy (United Institute for Nuclear Research), for their remarks and suggestions. Special gratitude is expressed to the Editor of the book, D.V. Shirkov, and to V.S. Vladimirov, for their cooperation in discussing the mathematical problems presented. There are 35 references, of which 12 are Soviet, 20 English, and 3 German.

TABLE OF CONTENTS:

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

Problems of the Theory (Cont.) SOV/1217

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Card 3/3

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

PHASE I BOOK EXPLOITATION 957

Bogolyubov, Nikolay Nikolayevich and Mitropol'skiy, Yuriy Alekseyevich

Asimptoticheskiye metody v teorii nelineynykh kolebaniy (Asymptotic Methods in Nonlinear Oscillation Theory) 2d., rev. and enl. Moscow, Fizmatgiz, 1958. 408 p. 7,000 copies printed.

Ed.: Zhabotinskiy, Ye. Ye.; Tech. Ed.: Kolesnikova, A.P.

PURPOSE: This book deals with the solution of problems of the theory of nonlinear oscillations by approximate asymptotic methods, and is intended for engineers and scientific workers.

COVERAGE: The book consists of an introduction and six chapters. Chapter I deals with the natural oscillations in systems close to linear with one degree of freedom. In Chapter II the basic concepts of the phase plane and of free oscillations in systems

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of relaxation type are studied and the large parameter method of A.A. Dorodnitsyn is presented. In Chapter III the authors investigate the effect of external periodic forces on oscillation systems. In Chapter IV single-frequency oscillations in systems with many degrees of freedom are analyzed and the method of slowly changing parameters, which now is extensively used in practice, is presented. In Chapter 5 the methods of averaging and their application to systems with many degrees of freedom are studied. Chapter 6 is intended for mathematicians interested in the theory of differential equations with small parameters. The foundations of asymptotic methods are considered and series of theorems on the existence and stability of periodic and almost-periodic solutions are established. In the introduction, Soviet personalities mentioned include A.M. Efros, A.M. Danilevskiy, N.M. Krylov, N.N. Bogolyubov and A.I. Lur'ye in connection with the development of symbolic methods of solution of differential equations. L.I. Mandel'shtam, N.D. Papaleksi, A.A. Andronov and

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A.A. Vitt are mentioned in connection with the application of Lyapunov-Poincaré methods to systematic analysis of nonlinear oscillations, and N.N. Krylov, N.N.Bogolyubov and Yu. A. Mitripol'skiy in connection with the asymptotic methods presented in this book. In the preface to the second edition the authors thank graduate student O.B. Lykov for his help in preparing the manuscript. There are 49 references, of which 49 are Soviet (including 5 translations), 3 English, 3 French, 1 German and 1 Italian.

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FRENKEL', Yakov Il'ich, [deceased 1945]; SEMENOV, N.N., akad. otv. red.; SOKOLOV, A.A. doktor fiz.-mat. nauk, red.; BOGOLYUBOV, N.N., akad., red.; TAMM, I.Ye., akad., red.; ANSEL'M, A.I., doktor fiz.-mat. nauk, red.; BLOKHINTSEV, D.I., doktor fiz.-mat. nauk, red.; KONTOROVA, T.A., kand. fiz.-mat. nauk, red. izd-va.; SMIRNOVA, A.V., tekhn. red.

[Selected works] Sobranie izbrannykh trudov. Moskva, Izd-vo Akad. nauk SSSR. Vol. 2. [Scientific articles] Nauchnye stat'i. 1958. 600 p. (MIRA 11:11)

1. Chlen-korrespondent AN SSSR (for Frenkel').
(Physics)

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BOGOLYUBOV, N.N.

Theory of the superconducting state. Nauch. dokl. vys. skoly; fiz.-mat. nauki no.1:3-11 '58. (MIRA 12:3)

1. Matematicheskiy institut im. V.A. Steklova AN SSSR.
(Superconductivity)

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

16(1), 24(5)

AUTHORS: Bogolyubov, N.N., Medvedev, B.V., and Polivanov, M.K. SOV/155-58-2-31/47

TITLE: On the Question on the Indefinite Metric in the Quantum Field Theory (K voprosu ob indefinitivnoy metrike v kvantovoy teorii polya)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Fiziko-matematicheskiye nauki, 1958, Nr 2, pp 137-142 (USSR)

ABSTRACT: The authors join the well-known publication of Heisenberg [Ref 2] in which the "physical" states with a positive norm are completed by "unphysical" states with a negative norm; in the Hilbert space of the state amplitudes this can be reached by the introduction of an indefinite metric. The authors investigate the possibilities resulting in the theory by the introduction of an indefinite metric. According to Heisenberg, the field is represented as a sum of a physical field $\psi(x)$ and a number of fictive fields $\psi_n(x)$. The corresponding state space H then is divided into a subspace H_1 containing only the physical particles of the type ψ, and into its orthogonal complement H_2: $H = H_1+H_2$. The arising specific difficulty (appearance of "unphysical" states in the asymptotic

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expressions of observed magnitudes) demands certain restrictions. Proposals referring to this have already been given by Gupta and Heisenberg. The authors investigate a third possibility: They assume that every amplitude consists of a physical and a non-physical part, where the non-physical part F is determined uniquely by the physical part φ. A physical dispersion matrix $\tilde{S}$ is defined by $\varphi_{+} = \tilde{S}\varphi_{-\infty}$, where $\varphi_{\pm}$ is the state of φ for $t = \pm\infty$, and it is shown that under certain additional postulates $\tilde{S}$ is unitary and the states of H_1 form a complete system for it so that no transitions from H_1 into H_2 are caused by it. Particularly simple states result in the case of the matrix K of Wigner. The proposed method is discussed by an example of the classical mechanics.
There are 4 references, 1 of which is Soviet, and 3 American.

ASSOCIATION: Matematicheskiy institut imeni V.A.Steklova (Mathematical Institute imeni V.A.Steklov)

SUBMITTED: March 5, 1958

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16(1)

AUTHORS: Bogolyubov, N.N., and Vladimirov, V.S. SOV/155-58-3-6/37

TITLE: A Theorem of the Analytic Continuation of Generalized Functions (Odna teorema ob analiticheskom prodolzhenii obobshchennykh funktsiy)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Fiziko-matematicheskiye nauki, 1958, Nr 3, pp 26-35 (USSR)

ABSTRACT: Let $x, \zeta, p \dots$ be the points $(x_0, x_1, \dots x_n)$, $(\zeta_0, \zeta_1, \dots \zeta_n)$, while $\vec{x} = (x_1, \dots, x_n)$, so that $x = (x_0, \vec{x}) \dots$. Let $x\zeta = x_0\zeta_0 - \vec{x}\vec{\zeta}$, $x^2 = x_0^2 - \vec{x}^2$ etc. Let S be a space of functions differentiable at infinity which together with their derivatives vanish in infinity quicker than $(x_0^2 - \vec{x}^2)^{-N}$, $N > 0$. A linear continuous functional over S is understood as a generalized function. Theorem: Let the generalized function $F_r(x)$, $F_a(x)$ vanish for $x_0 < 0$ and $x^2 < 0$ respectively or for $x_0 > 0$ and $x^2 < 0$ respectively. Let their Fourier transforms

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$$\tilde{F}_j(p) = \int F_j(x) e^{ipx} dx, \quad dx = dx_0\, dx_1 \ldots dx_n, \quad j = r, a$$

be identical in

(1) $p^2 < m$.

Then there exists an integral $N > 0$ so that in (1) it holds:

$$\tilde{F}_r(p) = \tilde{F}_a(p) = \sum_{k=0}^{N} P_k(p)\, \Phi_k(p^2),$$

where $P_k(p)$ are polynomials and the functions $\Phi_k(\xi)$ can be continued analytically in the whole complex w-plane with the exception of the cut

(2) $\operatorname{Im} w = 0$, $\operatorname{Re} w \geqslant m$.

Besides the $\Phi_k(w)$ in all points w being distant more than $\delta > 0$

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A Theorem of the Analytic Continuation of Generalized Functions SOV/155-58-3-6/37

from the cut (2) are bounded by a polynomial the degree of which does not depend on δ.
The author mentions S.L.Sobolev, and K.I.Babenko.
There are 11 references, 4 of which are Soviet, 2 French, 1 Italian, 2 American, and 2 Swedish.

ASSOCIATION: Matematicheskiy institut imeni V.A.Steklova AN SSSR (Mathematical Institute iemni V.A.Steklov, AS USSR)

SUBMITTED: April 16, 1958

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

AUTHOR: Bogolyubov, N. N., Academician 30-58-4-3/44

TITLE: Problems of the Superfluidity of Bose-and Fermi-Systems (Voprosy teorii sverkhtekuchesti Boze- i Fermi-sistem).

PERIODICAL: Vestnik Akademii Nauk SSSR, 1958, Nr 4, pp. 25 - 29 (USSR)

ABSTRACT: These problems require the use of methods which have been worked out for the solution of the multiple-body-problem. Though the superfluidity of helium was discovered much later than superconductivity, the first mentioned effect could be cleared much eadier because of works of the author. (Ref 1). It is commonly known that in the case of an ideal Bose-gas at sufficiently low temperatures a condensate falls out; at a finite relative number of particles the impulses are equal to zero. At zero-temperature all particles are in this state. But such a state does not have the qualities of superfluidity. If there is a repelling reciprocal effect, though weak, the condensate forms a combined collective. In the case of its movements as a whole the slowing down of single particles and their precipitation from the condensate is, with regard to energy, unprofitable if only the velocity of motion is satisfactory low. This way the quality of the superfluidity becomes apparent.

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To come to this result it was necessary to investigate the lower energetic spectral part of excitation. In doing this the author came upon a difficulty, namely, that the commonly used perturbation-theory cannot be applied here, even if the reciprocal effect between the particles is very low. The author proves this mathematically in using a special method of the cannonical conversions. He succeeded in generalizing this method and making it apt for the research of the superfluidity of Fermi-systems, besides all for composing the superconductivity--theory. (Ref 2). If one leaves the macroscopic effects out of account, which are caŭsed by the existence of the magnetic-field, the quality of the superconductivity may be regarded as the quality of superfluidity of the electron system in metals. In connection with this a very systematic investigation of the Frelich-model was made. The author emphasizes that the investigations prove the correctness of the formulae of I. Bardeen, L. N. Cooper and I.R. Schrieffer (Ref 3). There was also investigated the common scheme of the non-ideal Fermi-gas with weak reciprocal effect. It showed that in case that the attraction dominates the quality of superfluidity developes. In the result of investigations which the author made to a large extent together with D. N. Zubarev, V. V. Tolmachev, S. V. Tyablikov,

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Problems of the Superfluidity of Bose- and Fermi-Systems 30-58-4-3/44

D. V. Shirkov and Yu. A. Tserkovnikov he arrives at the conclusion that here we have an analogy to Bose-systems, a conclusion which largely corresponds to the works by M. R. Schafroth, S. T. Butler and I. M. Blatt (Ref 4). Finally the author mentions that at present many reasons lead to the assumption that the structure of the essential material is in some way or other similar to the structure of superconductive metals, an opinion which is also expressed by A. Bohr, Motel'son and Payns in their works. In the same way the experiments of D. I. Blokhintsev, as well as the works of A. I. Kvasnikov and V. V. Tolmachev, supply arguments for this opinion.
There are 5 references, 3 of which are Soviet.

1. Physics--Theory

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BOGOLYUBOV, N. N., BELEN'KIY, S. M. and LOGUNOV, A. A.

"Dispersion Relations for Weak Interactions," Nuclear Physics, 5, 1958, No. 2, January 1958. (North Holland Publ. Co., Amsterdam.

Abstract: Dispersion relations for weak interaction processes are obtained in the present paper.

It is shown that in processes which involve not only weakly interacting but strongly interacting particles as well, the dispersion relations are equivalent to the statement that the unknown amplitude functions, which are determined by strong interactions, depend only on momentum transfer between strongly interacting particles.

Joint Inst. of Nuclear Research, Laboratory of Theoretical Physics, Dubna, USSR

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SOV-25-58-8-9/61

AUTHOR: Bogolyubov, N.N., Academician, Lenin Prize Laureate

TITLE: The Theory of Superconductivity (Teoriya sverkhprovodimosti)

PERIODICAL: Nauka i zhizn', 1958, Nr 8, pp 17-20 (USSR)

ABSTRACT: The author gives a historical review on the discovery of both superconductivity and superfluidity, and explains these phenomena. The latter, he states, was discovered by Academician P.L. Kapitsa in 1938. It has been proved, that the physical nature of superfluidity and superconductivity is almost one and the same. There is a profound physical and mathematical analogy between these phenomena. To characterize it shortly - superconductivity is the superfluidity of electrons in metal. The theory of Academician L.D. Landau played an important role in explaining superfluidity. In 1947, the author succeeded in developing a successive microscopical theory of superfluidity and a special mathematical procedure which has been taken as a principle for solving completely the question of superconductivity. He was assisted in his works by D.N. Zubarev, V.V. Tolmachev, S.V. Tyablikov, Yu.A. Tserkovnikov and D.V. Shirkov. He explains the changes brought about by modern quantum physics in the conception of the conductivity

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The Theory of Superconductivity SOV-25-58-8-9/61

of metals and refers to the works of the American scientists J. Bardin, L.N. Cooper and J.R. Shriffer as an important contribution to the problem of superconductivity. In conclusion, the author points out that the theory of superconductivity opens wide prospects for solving many important problems connected with the use of superconductors in modern engineering. There is 1 graph and 4 drawings.

1. Superconductivity--Theory

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SOV/30-58-8-7/43

AUTHOR: Bogolyubov, N. N., Member, Academy of Sciences, USSR.

TITLE: The Main Principles of the Theory of Superfluidity and Superconductivity (Osnovnyye printsipy teorii sverkhtekuchesti i sverkhprovodimosti)

PERIODICAL: Vestnik Akademii nauk SSSR, 1958, Nr 8, pp. 36-46 (USSR)

ABSTRACT: Some metals loose their resistance entirely against electric current, if they are cooled to sufficiently low temperatures. This transition is characterized by a change of the electron structure in the metal. The temperatures of the phase transitions are very low. For pure metals they vary for example from 0,35°K for hafnium to 8°K for niobium. The phenomena of superfluidity were discovered by P. L. Kapitsa in 1938 with liquid helium which undergoes a phase transition at an absolute temperature of 2,19° and becomes superfluid. In this case the liquid helium consists of two components: one superfluid, without any viscosity, and a normal one. Research was conducted along two lines: the establishing of a phenomenological, i.e. macroscopic, and of a microscopic theory. The macroscopic theory of superfluidity was set up by F. and G. London in

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The Main Principles of the Theory of Superfluidity and Superconductivity

1935 and was improved by Pippard in 1953. The macroscopic theory of superfluidity was elaborated by Tissa in 1938 and was greatly improved by L. D. Landau in 1941. By his investigations V. P. Peshkov confirmed the accuracy of Landau's equations. The author tried to explain these phenomena by the theory of the ideal Bose-Einstein-(Boze-Eynshteyn)-gas, but comes to the conclusion, that this ideal gas does not exhibit the property of the superfluidity. In order to explain the phenomenon of superfluidity non-ideal Bose-Systems need be examined. On this basis the author elaborated a microscopic theory of superfluidity and published it more than 10 years ago. He gives a full description of his method by means of equations. Mathematically, he says, the property of superfluidity can be illustrated by the curve shown in figure 1. He observes that the phenomenon of the superconductivity can be interpreted as the phenomenon of the superfluidity of the system of free electrons in the metal. Attention is also paid to the conception of Frelikh, first mentioned by him in 1950, which he illustrated in form of a mathematical formula. In the Frelikh-Model the Hamiltonian (gamil'tonian) of the

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examined dynamic system consists of the sum of the effective electron- and phonon energies as well as of the Hamiltonian of the reciprocal effect which corresponds to the emission and absorption of phonons (Fig 2). New ideas came also from Shafrot, Batler and Blatt. Beginning in 1954 they developed the hypothesis of peculiar quasimolecules, which consist of 2 electrons and which obey to Bose-Statistics. The work of Kuper and Bardin and those of Shriffer in 1956 and 1957 represent a further advance in the theory of superconductivity. Still before the publication of these works in Moscow at the end of September last year the author succeeded to prove that the method of the development of the microscopic theory of superfluidity of Bose-Systems, based on the original Frelikh-Model , can be generalized for the development of the theory of superconductivity. He describes his method by means of formulae. V. V. Tolmachev, D. V. Shirkov improved the Frelikh-Model . The work by V. V. Tolmachev, S. V. Tyablikov confirm the correctness of the author's method.
There are 2 figures.

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV, N.N.

AUTHOR: None Given SOV-26-58-8-31/51

TITLE: A General Meeting of the Academy of Sciences of the USSR (Obshcheye sobraniye Akademii nauk SSSR)

PERIODICAL: Priroda, 1958, Nr 8, pp 112-113 (USSR)

ABSTRACT: The June 1958 meeting of the AS USSR was concerned with important actual problems. The chief paper was delivered by the Academy's president, Academician A.N. Nesmeyanov. It dealt with the forthcoming necessary faster development of the Soviet chemical industry, especially the branch of the production of synthetic materials and their derivatives. It is intended to equal the USA's present output of these materials by 1965. This calls for the establishment of new institutes and an expansion of the research bases of the aforementioned and other sciences. The meeting was listened to by Academicians N.N. Semenov, A.E. Arbuzov, V.A. Kargin, the President AS Azerbaydzhan SSR, Yu.G. Mamdaliyev, the corresponding members of the AS USSR A.A. Imshenetskiy, and N.M. Sisakyan, and the Doctors of Chemical Sciences N.G. Titov, and R.D. Obolentsev. The attendants in the meeting also listened to the paper of Academician N.N. Bogolyubov, on the "Basic Principles of the Theory of Superfluidity and

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SOV-26-58-8-31/51

A General Meeting of the Academy of Sciences of the USSR

Superconductivity" and of Academician D.I. Shcherbakov, on "Some Results of the Works of the Soviet Complex Antarctic Expedition". Bogolyubov explained the history of the theory and mentioned the relevant merits of the Dutchman Kammerling-Onnes, the Soviet physicist P.L. Kapitsa and the Italo-American Fermi. Shcherbakov mentioned that the Soviet Antarctic expedition carries out regular scientific observations on 6 out of 24 stations established on the Antarctic continent. Interesting data on the temperature and its changes was given together with observation results of the fauna of the Antarctic coast and the distribution regularities of birds and animals. Complex oceanographic research permitted the making of a first reliable map of the coast line of the Antarctic continent which disproves the former opinion on the level or slightly wavy relief of the sea bottom there. At this general meeting the body of the Academy was supplemented by the designation of 26 academicians and 55 correspondent members. Now the AS USSR has 167 academicians and 361 correspondent members. A total of 32 foreign

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SOV-26-58-8-31/51

A General Meeting of the Academy of Sciences of the USSR

scientists were elected members of the Academy. There are 2 Soviet references.

1. Scientific research--USSR 2. Chemical industry--USSR 3. Antarctic regions--USSR

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV, N.N.

AUTHOR: Bogolyubov, N.N. and Vladimirov, V.S. 38-22-1-2/6

TITLE: On the Analytic Continuation of Generalized Functions (Ob analiticheskom prodolzhenii obobshchennykh funktsiy)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Matematicheskaya, 1958, Vol. 22, Nr 1, pp 15-48 (USSR)

ABSTRACT: For generalized functions $F_r(x)$ and $F_a(x)$ which vanish for $x \lesssim 0$ and $x \gtrsim 0$ resp., and the Fourier transforms $\widetilde{F}_r(p)$ and $\widetilde{F}_a(p)$ of which are equal in a certain domain G^0, the authors prove the existence of a function of the complex variables $k_0, \ldots, k_3$ which is analytic in the domain G and is identical with $\widetilde{F}_r(p)$, $\widetilde{F}_a(p)$ for real $p \in G^0$. This general continuation theorem for generalized functions of several variables is needed in the proof of the fundamental theorem: Let translation-invariant generalized functions of four vectors

$$F_{ij}^{\nu}(x_1,x_2,x_3,x_4) \quad i,j=r,a \quad , \quad \nu = 1,2,\ldots,l$$

be given.

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Under transformations L from the full Lorentz group let these functions transform linearly with the aid of a certain representation A(L) :

$$F_{ij}^{\nu}(Lx_1, \ldots, Lx_4) = \sum_{1 \leqslant \nu' \leqslant 1} A_{\nu,\nu'}(L)\, F_{ij}^{\nu'}(x_1, \ldots, x_4)$$

Furthermore these functions are assumed to satisfy the following conditions:

$$F_{rr}^{\nu} = 0 \quad \text{for} \quad x_1 \lesssim x_3 \quad \text{or} \quad x_2 \lesssim x_4$$
$$F_{ra}^{\nu} = 0 \quad \text{for} \quad x_1 \lesssim x_3 \quad \text{or} \quad x_2 \gtrsim x_4$$
$$F_{ar}^{\nu} = 0 \quad \text{for} \quad x_1 \gtrsim x_3 \quad \text{or} \quad x_2 \lesssim x_4$$
$$F_{aa}^{\nu} = 0 \quad \text{for} \quad x_1 \gtrsim x_3 \quad \text{or} \quad x_2 \gtrsim x_4$$

The Fourier transformation

$$\int F_{ij}^{\nu}(x_1, \ldots, x_4) \exp i(p_1x_1 + \ldots + p_4x_4)\, dx_1 \ldots dx_4 = \delta(p_1 + \ldots + p_4)\, \widetilde{F}_{ij}^{\nu}(p_1 \ldots p_4)$$

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is considered, where $\tilde{F}^{\nu}_{ij}(p_1,\dots,p_4)$ are generalized functions of $(p_1,\dots,p_4)$ defined on the manifold $p_1+\dots+p_4=0$. Let the following conditions be satisfied:

$$\tilde{F}^{\nu}_{rj}-\tilde{F}^{\nu}_{aj}=0 \quad \text{for } p_1^2<(M+\mu)^2,\ p_3^2<G\mu^2,\quad j=r,a$$

$$\tilde{F}^{\nu}_{ir}-\tilde{F}^{\nu}_{ia}=0 \quad \text{for } p_2^2<(M+\mu)^2,\ p_4^2<G\mu^2,\quad i=r,a$$

$$\tilde{F}^{\nu}_{ij}=0, \text{ if } (p_1+p_3)^2<(M+\mu)^2 \text{ or } p_{10}+p_{30}<0, \text{ where } M>2\mu>0.$$

Then generalized functions $\tilde{\Phi}_\lambda(z,\xi)$ of the real variable ξ can be constructed with the following properties:

1. $\Phi_\lambda(z,\xi)$ are analytic in $z=(z_1,\dots,z_5)$ in the domain

$$|z_1-M^2|\leqslant\varsigma\mu^2,\ |z_2-M^2|\leqslant\varsigma\mu^2,\ |z_3-\tau|\leqslant\varsigma\mu^2,$$

$$|z_4-\tau|\leqslant\varsigma\mu^2,\ |z_5+\alpha^2|<\varsigma^2\mu^2\left(\frac{M}{t}\right)^2,\quad v\leqslant\tau\leqslant\mu^2, \qquad (1)$$

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$0 \leqslant \lambda \leqslant 2\sqrt{2}\mu$

2. $\widetilde{\phi}_\lambda(z, \xi) = 0$, if $\xi < (\frac{M+\mu}{2})^2$

3. for real $(p_1 \cdot\cdot p_4)$, $p_1 + \cdot\cdot + p_4 = 0$ for which the magnitudes $z_1 = p_1^2$, $z_2 = p_2^2$, $z_3 = p_3^2$, $z_4 = p_4^2$, $z_5 = (p_1 + p_2)^2$ satisfy the conditions (1), and for $\xi = (\frac{p_1+p_3}{2})^2$ it holds for $p_{10} + p_{30} > 0$ the representation

$$\widetilde{F}^{\nu}_{ij}(p_1, \ldots, p_4) = \sum p_{i_1}^{\alpha_1} \ldots p_{i_s}^{\alpha_s} \widetilde{\phi}_\lambda(z, \xi)$$

with a finite number of terms in the sum. This theorem can be applied in theoretical physics to the establishment of dispersion relations [Ref 1,2] . There are 13 references, 8 of which are Soviet, 3 French, and 2 English.

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On the Analytic Continuation of Generalized Functions 38-22-1-2/6

ASSOCIATION: Matematicheskiy institut imeni V.A. Steklova Akademii nauk SSSR (Mathematical Institute imeni V.A. Steklov, Academy of Sciences, USSR)

SUBMITTED: June 17, 1957

AVAILABLE: Library of Congress

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV NN

AUTHOR: Bogolyubov, N. Academician 29-4-3/20

TITLE: Another Secret of Nature Revealed (Raskryta yeshche odna zagadka prirody). The Theory of Superconductivity (Teoriya sverkhprovodimosti)

PERIODICAL: Tekhnika Molodezhi, 1958 Vol. 26, Nr 4, pp. 5-7 (USSR)

ABSTRACT: The Dutch scientist Kamerling Onnes made a strange discovery, 50 years ago. The superconductivity which he discovered, consists in the fact that some metallic conductors when cooled down to very low temperatures, offered no resistance to the current conducted through them. A great number of investigations was made since that time for finding out the reason for this secret. Some time later, the German researcher Meyssner succeeded in clarifying some extremely interesting magnetic properties of the superconductor. Also the scientists F. and G. London were successful in this field. The English scientist G. Frelikh contributed substantially to the clarification of some properties of the superconductor in 1950. The English scientists Shafrot, Batler and Blatt developed a new and important physical idea. They recognized the importance of the socalled correlation for the clarification of

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Another Secret of Nature Revealed . The Theory of Superconductivity. 29-4-3/20

superconductivity. Also the American scientists Bardin, Kuper and Shriffer started from the importance of the interaction of electrons and phonons. Yet they also did not succeed in solving the corresponding equation. A new method concerning the "new method in the theory of superconductivity" was elaborated by the author and his assistants D. N. Zubarev, V. V. Tolmachev, S. V. Tyablikov and Yu. A. Tserkovnikov. This method is based on the development of the idea of the microscopic theory of superviscosity which was published still 10 years ago. The phenomenon of superviscosity was discovered in 1938 by P. L. Kapitsa, Member of the Academy. Investigating liquid helium, he observed that the viscosity of helium disappears at temperatures close to the absolute zeromark. The theory by the Member of the Academy L. D. Landau played an important role in clarifying this phenomenon. The author succeeded in developing a logical microscopic theory of the superfluidity and to elaborate special mathematical processes serving as basis for the new method. This method made it possible to solve the problem of superconductivity completely. It was found that a superfluid liquid shows a high degree of well regulation. This is caused by an intense interaction of the particles.

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Another Secret of Nature Revealed . The Theory of Superconductivity. 29-4-3/20

The greatest difficulty was the compution of this interaction. The same difficulty was met in establishing the theory of superconductivity. An analogy of the two phenomena was found. By this it was proved that the superconductivity is nothing but the superviscosity of the electrons in the metal. It would be wrong to assume that the scientists are no longer interested in this problem since its solution. On the contrary, since the fundamental mechanism of this phenomenon is known, new practical problems result from it. The author hopes that this new method will be applied also in other fields of statistic physics, in first line in the theory of metals. There are 5 figures.

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1. Superconductivity-Temperature factors 2. Superconductivity-Theory 3. Conductivity-Temperature factors 4. Resistance-Effects of temperature

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BOGOLYUBOV, N.N., akademik.

Problems in the theory of superfluidity of Bose and Fermi systems.
Vest. AN SSSR 28 no.4:25-29 Ap '58. (MIRA 11:5)
(Fluids) (Electric conductivity)

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV, N.N., akademik

Fundamental principles of the theory of superfluidity and superconductivity. Vest. AN SSSR 28 no.8:36-46 Ag '58. (MIRA 11:9)
(Electric conductivity) (Helium)

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000205920007-6

BOGOLYUBOV, N. N.

AUTHOR: Bogolyubov, N. N. 56-1-10/56

TITLE: A New Method in the Theory of Superconductivity, I. (O novom metode v teorii sverkhprovodimosti, I).

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1958, Vol. 34, Nr 1, pp. 58-65 (USSR)

ABSTRACT: In the present paper the method of canonical transformation, as previously worked out by the author for the theory of superfluidity, is generalized. By means of this method it is possible to construct a consistent theory of the superconducting state. To simplify the representation the author proceeds from the model suggested by H. Fröhlich (reference 1). This model does not contain the Coulomb interaction in an explicit form, and the Hamiltonian which is characteristic of the dynamic system is given in an explicit form. The ordinary perturbation theory with regard to the powers of the coupling constant cannot be employed in this case. Therefore the author previously works out a certain canonical transformation. In this connection different considerations are mentioned. The choice of the canonical transformation must guarantee the mutual compensation of the

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